ADVANTEST

ADVANTEST CORPORATION

TR5821/22/23/23H

Universal Counter

Operation Manual

MANUAL NUMBER FOE-8311233K03

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First printing June 1, 1982
Printed in Japan

Safety Summary

To ensure thorough understanding of all functions and to ensure efficient use of this instrument, please read the manual carefully before using. Note that Advantest bears absolutely no responsibility for the result of operations caused due to incorrect or inappropriate use of this instrument.

If the equipment is used in a manner not specified by Advantest, the protection provided by the equipment may be impaired.

- **Warning Labels**

  Warning labels are applied to Advantest products in locations where specific dangers exist. Pay careful attention to these labels during handling. Do not remove or tear these labels. If you have any questions regarding warning labels, please ask your nearest Advantest dealer. Our address and phone number are listed at the end of this manual.

  Symbols of those warning labels are shown below together with their meaning.

  DANGER: Indicates an imminently hazardous situation which will result in death or serious personal injury.

  WARNING: Indicates a potentially hazardous situation which will result in death or serious personal injury.

  CAUTION: Indicates a potentially hazardous situation which will result in personal injury or a damage to property including the product.

- **Basic Precautions**

  Please observe the following precautions to prevent fire, burn, electric shock, and personal injury.

  - Use a power cable rated for the voltage in question. Be sure however to use a power cable conforming to safety standards of your nation when using a product overseas.
  - When inserting the plug into the electrical outlet, first turn the power switch OFF and then insert the plug as far as it will go.
  - When removing the plug from the electrical outlet, first turn the power switch OFF and then pull it out by gripping the plug. Do not pull on the power cable itself. Make sure your hands are dry at this time.
  - Before turning on the power, be sure to check that the supply voltage matches the voltage requirements of the instrument.
  - Be sure to plug the power cable into an electrical outlet which has a safety ground terminal. Grounding will be defeated if you use an extension cord which does not include a safety ground terminal.
  - Be sure to use fuses rated for the voltage in question.
  - Do not use this instrument with the case open.

- Do not place objects on top of this product. Also, do not place flower pots or other containers containing liquid such as chemicals near this product.
- When the product has ventilation outlets, do not stick or drop metal or easily flammable objects into the ventilation outlets.
- When using the product on a cart, fix it with belts to avoid its drop.
- When connecting the product to peripheral equipment, turn the power off.

- **Caution Symbols Used Within this Manual**

Symbols indicating items requiring caution which are used in this manual are shown below together with their meaning.

DANGER: Indicates an item where there is a danger of serious personal injury (death or serious injury).

WARNING: Indicates an item relating to personal safety or health.

CAUTION: Indicates an item relating to possible damage to the product or instrument or relating to a restriction on operation.

- **Safety Marks on the Product**

The following safety marks can be found on Advantest products.

: ATTENTION - Refer to manual.

: Protective ground (earth) terminal.

: DANGER - High voltage.

: CAUTION - Risk of electric shock.

- **Precautions when Disposing of this Instrument**

  When disposing of harmful substances, be sure dispose of them properly with abiding by the state-provided law.

  Harmful substances: (1) PCB (polycarbon biphenyl)
  (2) Mercury
  (3) Ni-Cd (nickel cadmium)
  (4) Other
  Items possessing cyan, organic phosphorous and hexadic chromium and items which may leak cadmium or arsenic (excluding lead in sol der).

  Example: fluorescent tubes, batteries

Environmental Conditions

This instrument should be only be used in an area which satisfies the following conditions:

- An area free from corrosive gas
- An area away from direct sunlight
- A dust-free area
- An area free from vibrations

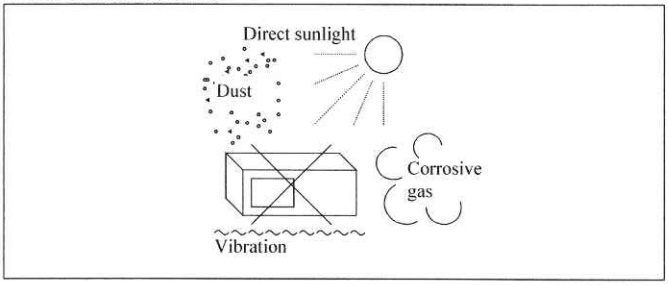


Figure-1 Environmental Conditions

- Instrument Placement

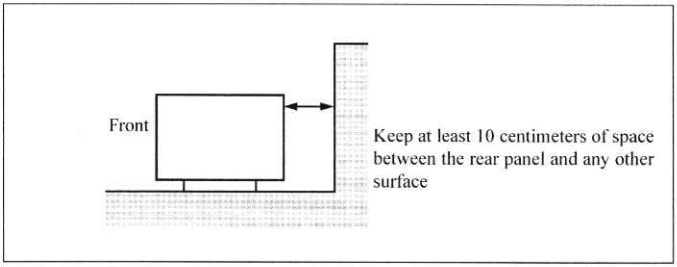


Figure-2 Instrument Placement

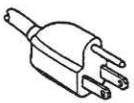
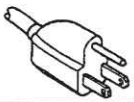
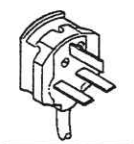
This instrument can be used safely under the following conditions:

- Altitude of up to 2000 m
- Installation Categories II
- Pollution Degree 2

Table of Power Cable Options

There are six power cable options (refer to following table).

Order power cable options by Model number.

	Plug configuration	Standards	Rating, color and length	Model number (Option number)
1		JIS: Japan Law on Electrical Appliances	125 V at 7 A Black 2 m (6 ft)	Straight: A01402 Angled: A01412
2		UL: United States of America CSA: Canada	125 V at 7 A Black 2 m (6 ft)	Straight: A01403 (Option 95) Angled: A01413
3		CEE: Europe DEMKO: Denmark NEMKO: Norway VDE: Germany KEMA: The Netherlands CEBEC: Belgium OVE: Austria FIMKO: Finland SEMKO: Sweden	250 V at 6 A Gray 2 m (6 ft)	Straight: A01404 (Option 96) Angled: A01414
4		SEV: Switzerland	250 V at 6 A Gray 2 m (6 ft)	Straight: A01405 (Option 97) Angled: A01415
5		SAA: Australia, New Zealand	250 V at 6 A Gray 2 m (6 ft)	Straight: A01406 (Option 98) Angled: ---------
6		BS: United Kingdom	250 V at 6 A Black 2 m (6 ft)	Straight: A01407 (Option 99) Angled: A01417

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SECTION 1
GENERAL INFORMATION

1-1. General

The **TR5821/5822/5823/5823H** are compact, inexpensive universal counters with the capabilities comparable to medium-scale counters. These are the It became possible to process data with a self-diagnostic function and various operations (by using **TR1644**). Since GPIB, BCD (TTL) output, and analog output (D/A converter) are available, these equipments can support various system.

TR5821 is a universal counter that can measure frequencies of up to 120 MHz, and can display results in arbitrary form with **TR1644** (an extra-cost option).

The **TR5822** has the same functions as the **TR5821** plus a built-in GPIB interface, and the functions of the **TR5823** include an ultrahigh-frequency measurement (1.3 GHz) and a burst signal measurement in addition to the functions of the **TR5821**.

The **TR5823H** is provided with the high-stability oscillator (aging rate: 5×10^{-8}/day) as a standard feature plus the capabilities of the **TR5823**.

* The **TR5823** described in this manual also includes the functions of the **TR5823H**.

1-2. Caution

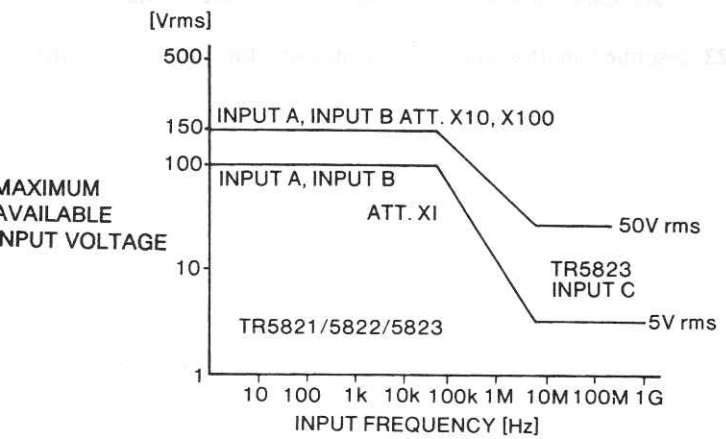
1. With **POWER ON**, self-check is automatically initiated; any failure will produce an error message **"E01, E07, E10"** for about 2s. When **POWER** is **ON** after **RESET ON**, check of panel switches is performed (See instruction manual 3-3-3 for details).

2. When a panel switch is pressed, function is selected and the instrument is in the standby state; when released, operation is strarted in the **TOT**. mode, totalize operation continues but display is held while the **ON/OFF** switch is being pressed (**GATE** lamp on); when released (**GATE** lamp off), totalized result is displayed.

3. Though selectable by function selector switch, ◀▶ position on **TR5821/5822** is not used. Move to any other position.

4. **In case of frequency measurements (FREQ.B/TR5821, TR5822, TR5823, TR5823H), when the rapid switching of input frequency happen, the timing of switched frequency may cause, the measurement time to get longer.**

5. Damage input levels are shown as follow.



SECTION 2
SPECIFICATIONS

2-1. Electrical Performance

Frequency measurement (FREQ. A)

Range : 10 Hz to 120 MHz
Gate time : 10 ms, 0.1 s, 1 s, or 10 s
Unit display : Hz, kHz, or MHz
Accuracy : ± 1 count ± time base accuracy

Frequency measurement (FREQ. B)

Range : 1 mHz to 50 MHz
Gate time : 10 ms (9 ms to 0.1 s), or 1 period time of input frequency below 10 Hz. Five display digits.
0.1 s (90 ms to 1 s), or 1 period time of input frequency below 1 Hz. Six display digits.
1 s (0.9 s to 10 s), or 1 period time of input frequency below 0.1 Hz. Seven display digits.
10 s (9 s to 100 s), or 1 period time of input frequency below 10 mHz. Eight display digits.
Unit display : mHz, Hz, kHz, or MHz
Accuracy : ± (Trigger error/10^m) ± 1 count ± time base accuracy
Where 10^m is the number of periods. See 5-3-2.

Note: When the rapid switching of input frequency happen, the timing of switched frequency may cause, the measurement time to get longer.

Frequency measurement (FREQ. C) (TR5823)

Range : 100 MHz to 1300 MHz (1/20 prescaled)
Gate time : 20 ms, 0.2 s, 2 s, or 20 s
Unit display : Hz, kHz, MHz, or GHz
Accuracy : ± 1 count ± time base accuracy

Period measurement (PERIOD B)

Measurement range: 20 ns to 999.99999 s (including when averaged)
Multiplier (10^n) : 10^0, 10^1, 10^2, or 10^3
Time unit : 100 ns
Unit display : ns, μs, ms, or s
Accuracy : ± (Trigger error/10^n) ± 1 count ± time base accuracy

Time interval measurement (T.I. A → B)

Range : 200 ns to 999.99999 s
Multiplier (10^n) : 10^0, 10^1, 10^2, or 10^3
Time unit : 100 ns
Unit display : ns, μs, ms, or s
Accuracy : ± (Trigger error/$\sqrt{10^n}$) ± 1 count ± time base accuracy
Dead time : 50 ns

Frequency ratio measurement (RATIO A/B)

Range : DC to 50 MHz
Multiplier (10^n) : 10^0, 10^1, 10^2, or 10^3
Unit display : m, k, or M
Accuracy : ± (Input B trigger error/10^n) ± 1 count ± Input A accuracy

Totalize (TOT. A)

Range : DC to 50 MHz, 0 to 99999999

Input Specifications

INPUT A/B

Input sensitivity	: 25 mVrms, DC to 100 MHz 55 mVrms, 100 MHz to 120 MHz
Sensitivity switching	: x1, x10, and x100
Input voltage range	: 25 mVrms to 500 mVrms (at x1)
Damaging input level	: DC to 100 kHz: 100 Vrms (x1), 150 Vrms (x10 or x100) 100 kHz to 120 MHz: 5 Vrms (x1), 50 Vrms (x10 or x100)
Input coupling mode	: DC or AC coupled, or AUTO (AC coupled)
Input impedance	: Approx. 1 MΩ//30 pF, COM. A approx. 500 kΩ
Pulse resolution	: 10 ns
Trigger level	: Approximately −1 V to +1 V continuously variable. In the **AUTO** mode, the trigger level is automatically set to the half-amplitude of the peak value of the signal to be measured.
Trigger slope	: +/− switchable
Common/Separate	: **COM.** handles inputs A and B as common input. **SEP.** handles inputs A and B separately.
Masking	: Approx. 0.1 ms to 0.1 s. The masking time can be monitored at CHECK mode.
Noise rejection	: 100 kHz low-pass filter

INPUT C (TR5823 only)

Input sensitivity	: 20 mVrms, 100 MHz to 1300 MHz
Sensitivity switching	: x1 and x10
Input voltage range	: 20 mVrms to 500 mVrms (at x1)
Damaging input level	: 5 Vrms (with protection fuse)
Input coupling mode	: AC coupled
Input impedance	: 50 Ω
Burst mode	: **BURST** switch operation enables burst signal measurement.
Noise rejection	: Automatically suppressed by ANS (Automatic Noise Suppressor) (ON-OFF switching)

Time Base

Internal reference frequency : 10 MHz

Frequency stability : Aging rate: $\pm 5 \times 10^{-7}$/month
Temperature stability: $\pm 5 \times 10^{-6}$ (0°C to ±40°C)
Line voltage: $\pm 2.5 \times 10^{-7}$ (100 V ± 10%)

Internal reference output: Frequency: 10 MHz
Output voltage: 1 V_{p-p} to 2 V_{p-p}
Output impedance: approx. 500 Ω

External reference input: Frequency: 10 MHz
Input voltage: 1 V_{p-p} to 10 V_{p-p}
Input impedance: approx. 500 Ω

2-2. General Specifications

Display : 8 decimal digits
Green, 7-segment LED, display storage method

Sample rate : 50 ms or hold

Self-check : Counting operation check by internal reference signals

Operating environment : Temperature: 0°C to +40°C
Relative humidity: 85% or less

Storage temperature : −20°C to +70°C

Power requirements : 90−110 V, 108−132 V, 198−242 V, 216−250 V
50 Hz to 400 Hz,

Power consumption: 40 VA or less (**TR5821/22/23**)

Dimensions : (W)240 x (H)88 x (D)280 mm approx.

Mass : 3.5 kg or less (**TR5821**)
4 kg or less (**TR5822/5823**)

2-3. Options

GPIB data output & remote control

Standard	: IEEE STD. 488–1978
Interface functions	: Source and acceptor handshake Talker/listener Service request Device clear
Code used	: ASCII code
Remote-programmable functions	: Function Gate time/Multiplier Hold

BCD data output

Data	: Digit parallel
Output digits	: Mantissa 7 digits, exponent 1 digit
Output level	: TTL, positive logic

D/A converter (requires TR1644)

Output voltage	: 0.999 V full-scale
Conversion digits	: Any 3 consecutive digits
Output terminal	: Binding post
Output impedance	: Approx. 1 kΩ

DA output is not done at the function of TOT.

High-stability reference oscillator

Stability : Aging rate: 5×10^{-8}/day
Temperature characteristics: $\pm 1 \times 10^{-7}$, 0°C to +40°C

The internal reference output and external reference input specifications are the same as the standard time base.

TR1644 Calculation Unit

Math mode	: ± (addition, subtraction), × (multiplication), ÷ (division), DAC (D/A converter mode), comparison, delta, Max., Min., %, scaling, arithmetic operation between set values by using = key (±, ×, ÷)
Digit	: Setting: Mantissa 8 digits, exponent 1 digit Display: 8 digits